

WITH THE AUTHOR'S COMPLIMENTS.

ON THE ACTIONS
OF SEPSIN, OF LEAD
AND OF
CERTAIN ALLIED AGENTS. 15.

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ON THE ACTIONS OF SEPSIN, OF LEAD AND OF CERTAIN ALLIED AGENTS.

BY EDWARD BLAKE, M.D.

BEFORE I draw the attention of the reader to a curious resemblance, as regards elective sites of operation, between *sepsin* and certain inorganic poisons, I will briefly say what I mean by "sepsin."

I shall, in the following pages, include under the rather comprehensive term "sepsin," all the products of decomposition which are found in or on the human body during life.

Of course the word is convenient rather than exact, for it includes an infinite variety of compounds of unstable constitution, tending perpetually to change. Usually agreeing, however, in being ternary compounds of carbon, hydrogen and nitrogen, and, fortunately for physicians, exhibiting a felicitous unanimity in site selection and in mode of action.

Dr. B. W. Richardson claims to have isolated *sepsin* with the aid of Sir Spencer Wells as early as 1860. Dr. Richardson suggested the word "septine" for his product. This term was afterwards replaced by a more popular but less convenient, name "sepsin," applied to a material obtained later by Bergmann from decomposing yeast.

For the sake of simplicity it would be a good plan to reserve the words "septine" and "septic" to denote generally the products of decomposed material formed in or on the body during life.

To reserve "pyosis" for pus introduced *quâ* pus directly into the circulation.

To speak of the process of poisoning as "toxis," conveniently divisible into "autotoxis" and heterotoxis."

To abandon the word "rheumatism" as too vague, and to replace it by the name of the particular tissue change, qualified by the probable causation. For example "septic synovitis," "traumatic chondritis" etc.

The adjective "rheumatic" might be retained as a temporarily useful term to distinguish a morbid auto-toxic process, as "rheumatic iritis," from an obviously ectoxic form—"specific iritis."

All the words ending with "æmia" should certainly be dismissed as postulating more than can be proved, and as being exceedingly misleading to the beginner.

"Ptomaine" might be reserved for products found after death, though there are obvious disadvantages in having two terms, ptomaine and leucomaine, for identical substances, differentiated only by the fact of being yielded by a dead or by a living body!

It should be clearly understood that there exists no such thing as "septine" viewed as a definite entity, having a fixed formula, but that it is a generic name for a group of nitrogenised carbohydrates known by many names as toxines, albumoses, ptomaines, leucomaines, animal alkaloids and toxalbumens, resembling various vegetable alkaloids in constitution and in action; we may then proceed to consider the remarkable similarity which may be traced between the action of the septines and that of the soluble salts of certain metals, such as lead and uranium.

It is strange that such entirely dissimilar substances as the metal lead and septic matter should closely resemble each other in action.

Dr. Oliver, at p. 102 of his classic work on *Lead Poisoning*, following Bouchard, suggests very pertinently that the apparent results of plumbism may be really due to the action of katabolic products retained in the economy on account of the effect of lead on those great emunctories the liver and the kidney. This would readily explain the resemblance. As against it we must remember that *sepsin* and lead have been known to act as antidotes to one another.

If it be true that they coincide so closely, then the fact serves to confirm the truth of the conclusion that micro-organisms do not react *per se* on the tissues which they invade, and to make it still more probable that they exert their influence by means of toxines which they produce from normal proteids.

This view, you will remember, was advanced by M.M. Roux and Yersin as early as 1888. Supported by no less an authority than Burdon Sanderson, it has

received a complete confirmation at the hands of Martin, in his publication on diphtheria, reported in a recent number of *The Lancet*.

Both *septime* and lead seem to strike a terrible blow at nutrition, not alone by disturbing digestion, and inducing a series of dystrophies *via* the nervous system, but by modifying in the most profound manner the hæmato-poiëtic function of the bone-marrow.

The extreme pallor of septic and of saturnine subjects, bears witness to the fact that a steady osteo-myeloid degeneration goes on in both classes.

Until quite recently, lead was looked upon as a direct muscle-poison.

This view has been disturbed by a number of considerations.¹ To begin with, the symmetry of the palsies induced by lead, suggests a dianeurotic action. Again, certain groups of muscles are specially selected. It is rare to see the supinator longus affected. Like the biceps, it is a flexor of the elbow, and, to render concerted action easy, the ganglia of its motor roots stand in a higher segment of the spinal cord than those of the extensors of the wrist.

Lead encephalopathies point to a primary nerve-centre action.

Again lead and *sepsin* appear to possess the property of putting to sleep the inhibition centres of the heart and of the uterus.

These organs are then prone to run riot, leading in the case of the heart to tachycardia;² in the uterus to dysmenorrhœa on the one hand and to premature birth on the other.

These are in themselves strong testimonies in favour of a pernervous method of attack.

Add to them, that there are some reasons for supposing that lead, like *sepsin*, has the power of paralysing the vaso-motor nerves of the kidney, thus causing an excellent imitation of adolescent Bright's Disease (orthal-

¹ Heubel has shown that, with equal weights of material, the muscles are, of all the tissues of the body, those which contain the smallest quantity of lead in saturnine poisoning.

²—1. Minute doses of degraded tissue material form possibly the normal stimulus of the heart; witness, for example, the exhilaration which follows exercise. 2. Larger doses over stimulate the heart—athletic sleeplessness. 3. Overdoses cause profound sopor—toxic coma of uræmia and of extreme fatigue.

buminuria). This is the kind of albuminuria to which tall boys are particularly prone, if the vertical posture be assumed early in the day, especially when fasting. A typical example is afforded by the celebrated Rugby cases narrated in *The Lancet* of 1891.

a But the changes induced by lead in the kidneys are, whilst superficially resembling those of *septine*, of a far graver character. The typical lesion is nephritis, first of parenchymatous type, presently succeeded by an interstitial form of most hopeless and destructive type. There is an increased exudation of leucocytes under the renal capsule and around the afferent vessels of the Malpighian glomeruli. Bowman's capsule becomes thickened, and the laminated cells which make up its internal lining are greatly multiplied, they lie in irregular heaps inside the capsule. Hypertrophic arteritis is seen here as in the eye, reminding one of the same double change in gout. As the kidneys cease to eliminate, of course peril to life begins.

It has been hinted that *septine* and *lead salts* still further resemble one another in producing an entirely different group of symptoms in the two sexes. It was supposed formerly that women are less prone than men to suffer from plumbism. This error arose evidently from the want of recognition that the stress of the poison falls in man on the motor apparatus, in woman it tends to disturb the nervous system.

I do not propose here to notice the symptoms of acute sepsis as it appears in women. We know its characteristic phenomena too well under the name of "child-bed fever."

Thanks to the general spread of a knowledge of hygiene, to greater cleanliness and to the world-wide acceptance of the leading principles of Listerism, puerperal septicæmia—an entirely preventible disease—happily for us, is daily becoming more rare in civilised communities.

Disregarding the rarer and more recondite results of *sapremia*, we will glance quickly at the ordinary phenomena of passive pus-poisoning in a female patient.

As the subject of septic absorption enters the room, we are struck first by her death-like pallor. There are exceptions, some women become sallow, some bronzed, so as to resemble a case of Addison's disease or one of

the other disorders connected usually with xanthelasma, others present discrete spots of melanosis, the favourite sites being the forearm and the face.

Acne rosacea will follow pyorrhœa alveolaris, and vaginal xanthorrhœa is often associated with pustules on the chin (acne menti).

The rose spots on the abdomen of an enteric patient are probably of the same nature. It will be remembered that they do not appear during the first week of the disease, in other words, till there is time for the establishment of necrosis in the neighbourhood of Peyer's patches.

Under the influence of lead the features become blunted and expressionless. On examining the blood, whilst there is no increase in the proportion of white cells to the total blood mass, the red cells notably decrease in number.¹ The colouring matters fall as low as 45 to 50 per cent. There is an arrest of hæmatopoïesis, as in septic invasion. Lead has been found in the marrow of the bones. Raimondi found atrophy and degeneration of the bone marrow as in male gonorrhœa. This is the most frequent condition. As serving to show that the action of lead on the womb is not direct, the menses may be either greatly augmented or sensibly diminished in quantity.

Extreme thirst is seen in animals poisoned by lead.

In old cases of septic invasion, the corner of the mouth is prone to show a fissure. This cracking of the lip-commissure appears preferentially on the side of decubitus. It is not quite so insignificant a matter as might at first blush be thought, for the act of opening the mouth becomes so painful that the patient would cease to eat unless the corner were protected. A strip of adhesive plaster serves sufficiently well for this purpose. I have in these cases tested the saliva both before and after food; I have found it acid even when escaping from the salivary duct, antecedent to its admixture with the mucus of the mouth. Lead too is said to diminish the alkalinity of the blood (Ralfe, Oliver.) It is possible that the mere subalkalinity of the blood which passes through the cortex may induce various neuro-psychotic phenomena as ill-temper, headache, despondency, chorea or epilepsy. We have seen how much the last of these is influenced by the various salts of *sodium* and *potassium*.

¹ Compare with recent observations by Dr. Archibald Garrod on the blood changes of rheumatism.

This property, possessed by the alkalies, of modifying some nerve storms, may depend on mere chemical action rather than on any specific relation to the pathological condition. The advent of the epileptiform convulsion is aided doubtless by the contracted state of the cerebral arterioles.

Epilepsy, not unusual as a result of lead-poisoning, is not ordinarily recognised as a septic symptom. Professor Wood, of Michigan University, has narrated the particulars of a case, and I have myself placed two on record. One showed petit mal associated with depravity, the other genuine epilepsy.

Recurrent nettlerash, as well as lichen urticatus, especially the post partum form, should lead us to search for septic intoxication and to take immediate steps for its remedy.

Hyperidrosis of the hands, the feet and the axillæ is by no means uncommon in sepsis. Compare this with the localised sweats observed by Dr. Kent Spender in the course of osteo-arthritis, also with the experience of Dr. Bowlan, of Newcastle, who found in a female subject of saturnism, unequal radial pulses and persistent profuse perspiration of the left hand only.

Professor Bedson has twice detected lead in the perspiration. Drs. Ord and Spender have also pointed out various sensory perversions as occurring in the course of rheumatic gout, itself often septic in origin. Such are lightning pains of the lower extremity, a sense of tearing up of the skin, spots of anæsthesia and of hyperæsthesia. These are common in septic cases. They serve to show that rheumatic gout is not merely a disease of the joints. Rheumatic tremors, shared by lead patients, point in the same direction.

The extremities rise in temperature during the chondritic stage of rheumatic gout. *This increase in surface-warmth is general; it is not confined to the point of incidence of the arthropathy.* Afterwards the limbs are prone to be purple and chilled. The arterial tension is heightened at first by septine as it is by lead, and is followed, after the reactive dilatation, by the same increased vigour of ventricular contraction.

But there is a later stage in septic invasion where the systole is defective even to the extent of developing anginous symptoms, as I have more than once witnessed.

Mental solicitude and gloom are nearly always present in septic as well as in saturnine patients.

The memory is sometimes seriously impaired in sepsis. Drs. Oliver and Campbell Clark have reported this symptom in saturnism.

In the case of lead, nervous terror, sometimes associated with distinct delusions, and excessive restlessness, have been recorded by Dr. Thomas Oliver.

For a full account of the lead encephalopathies I must refer my hearers to the splendid monograph¹ from which I have so freely quoted. They are chiefly hysteria, dementia, acute mania, epilepsy.

It should be remembered that mania, with hallucinations, has followed a vaginal douche of lead, by no means an uncommon prescription.

Briefly, the most ordinary types of lead poisoning are:—

(a) Anæmia, blue line on gums, emaciation, sickness, dysmenorrhœa, headache, hysteria, unilateral clonus followed by epilepsy, unconsciousness, convulsions and death.

(b) Another type is headache, delirium, acute mania or else melancholia, imperfect speech, hard pulse, anuria and death: or recovery may take place with temporary or else permanent blindness.

(c) The third type is the neuro-muscular; there may be colic; numbness of one or more fingers or in the arms, with paralysis of some special group of voluntary muscles, not necessarily connected with impaired sensation, but always followed by rapidly developing muscular atrophy.

There is an excess of fluid in the cerebral ventricles and in the perivascular spaces, due doubtless to arterial shrinkage. The brain is sometimes found abnormally dry, sometimes flattened by the pressure of the fluid.

The typical plumbic headache appears to be frontal; in the four thousand two hundred symptoms of saturnism recorded in Allen² there are twenty-six frontal headaches, eight temporal, five parietal, and six occipital. This does not of course represent forty-five different poisonings, so that it may only mean that frontal headaches are com-

¹ *Lead Poisoning*. Oliver. Pentland, 1891.

² *Encyclopædia of Pure Materia Medica*. Boericke and Tafel, New York. 1878.

moner than others, or that the provers happened to be more prone to that kind of headache.

Lead, like arsenic, seems to have the power to induce fibrillary tremors of the tongue and the lips.

The septic tongue is peculiar, the type of acute sepsis being the enteric tongue, in chronic cases it may be coated, sometimes preternaturally clean, with raised irritable papillæ. Sometimes very thin at the edge, often œdematous—showing the marks of the teeth. Anorexia is the rule in lead poisoning.

In acute sepsis, as after diphtheria, we may have pharyngeal paralysis; in acute saturnism we get spasm of the pharyngeal constrictors, both are prone to be followed, at a later stage, by incoördination of the muscles concerned in swallowing.

Loss of appetite, resulting in emaciation, is common to both these poisonings. The so-called lead-line is not of much use in diagnosing saturnism; a similar line is present in bismuth and carbon cases, a green line in copper poisoning. The line is said to be missing when the patient is in the habit of cleaning the teeth.

I have seen three cases of gastralgia, of six weeks', three years', and ten years' duration respectively, disappear on removing pus depôts.

The eye symptoms of sepsin present a superficial resemblance to those of lead, but there is a deep-seated difference. Chromatopsia has been recorded as arising from lead.

Sepsin is very prone to produce supraorbital pain, sometimes symmetrical, more frequently sinistral, rarely on the right side. The lead headache is on the right side. Asthenopia is common to both lead and sepsin. The defective vision of sepsin is usually an accommodation error of temporary character; but permanent blindness from optic atrophy has more than once followed poisoning by lead. It is curious that sepsin appears to pick out the nervous and muscular structures and the choroidal coat. Lead first attacks the vessels (hypertrophic arteritis) of the retina. This has been verified by John Couper. The observations of Dr. Rayner D. Batten make it likely that septic saturation may intensify myopia. *Ophth. Rev.*, Jan., 92.

Once I saw lenticular cataract supervene in a man of forty, on ulceration of the gums, probably of specific

character. Mr. Juler, of St. Mary's, tells me that he has seen cataract co-existing with intraoral suppuration.

Ten persons poisoned by lead had *tinnitus aurium*, which is a common symptom of sapræmia.

Tanquerel alludes to laryngeal palsy. Morell Mackenzie points to lead as a cause of paralysis of the adductors of the vocal cords.

We have seen that sepsin appears to possess the property of causing pain in the terminal twigs of the anterior or ventral branches of the fourth, fifth and sixth dorsal nerves.

Lead, on the other hand, selects in preference the same portion of the tenth and eleventh intercostals.

Just as sepsin will induce pain by preference in the left supraorbital branch of the fifth cranial, so lead causes a tetanic cramp of the left rectus abdominis supplied by the tenth and eleventh dorsal nerves.

This tonus of the rectus has been erroneously described as "lead colic." Similarly perineuritis saturnina, because it is usually seen in the same locality, has been mistaken for colic. These forms of pain are distinguished by being relieved and intensified by pressure respectively. Whilst both are probably purely parietal, and though they may alternate in the same subject, they demand widely differing methods of treatment.

The parietal tonus (tetanic cramp of rectus abdominis) is analogous to the false pains which precede labour. If the lead worker be pregnant she is prone to miscarry, not because lead is a stimulant to the genital muscles but more likely because it has the property of abolishing the inhibitory function of the uterine centre, presumably near the site of the vagal nucleus. So sudden and violent are the uterine contractions which sometimes follow the introduction of lead into the system that a doe rabbit had a large rent torn in the uterine wall. The soothing of this centre by various agencies, as sepsin, shock, lead, carbon disulphide, cocculus, savine, quinine, and ergot, may lead to vaginismus and dysmenorrhœa in the case of an unimpregnated woman, and to abortion in the gravid state.

Of course it has been the custom with us to look upon lead as a stimulant of the muscular fibres of the utero-vaginal tract. I have shown that there are reasons for thinking that it does not probably act on these at all,

but that it paralyses their centres of control above the cord, possibly in the medulla. The honour of possessing the uterine centre is at present divided between the medulla oblongata, the corpora quadrigemina, the corpora striata, and the posterior portion of the optic thalamus.

It has always been a problem why artificial anæsthesia does not necessarily delay labour, we have here a simple solution of the matter.

The possibility of the presence of afferent fibres in the phrenic has been demonstrated¹ so that we may now regard it as a nerve of more complex character than was once supposed.

Drs. Pearson Irvine and Wm. Pasteur have shown that death from diphtheria, especially in boys, often comes from paralysed phrenic. This is confirmed by Suckling, of Birmingham. It is interesting, as showing another point of contact between pus and lead poisoning, for phrenic palsy occasionally closes the scene in acute lead poisoning.

In lead poisoning, intercellular hepatic cirrhosis, resembling the condition which is recognised in cases of congenital syphilis, appears to be one of the most constant lesions.

The analogue in septic intoxication is lardaceous disease. In both cases the liver ceases to seize upon and change the various degenerative gastro-intestinal products, which now enter the general circulation and prove most pernicious, especially to the nerve centres.

In lead poisoning, muscles usually lose their faradic but retain their voltaic irritability, this fact naturally leads observers to class lead with curare as a direct muscle poison.

Dr. Oliver on this subject says:—

“There is a form of generalised paralysis of rapid development occasionally met with in lead poisoning. The muscles are paralysed in their whole length and *en bloc*, the muscles of any region sometimes within a day becoming absolutely powerless. Those who are the subjects of other forms of paralysis may thus suffer; in these the malady may invade rapidly, and in succession, muscles that had hitherto escaped. Sometimes, indeed, a generalised paralysis is induced, either in an ascending

¹Dr. John Ferguson of Toronto. *Brain*. 1891. *Lancet*, Jan. 16, 1892.

or descending form, which extends rapidly day by day, always invading the whole length of the muscles of the limbs, the trunk, abdomen, and thorax. The patient occupies the dorsal decubitus, unable to move a limb, and is even incapable of eating; the intercostals, the diaphragm, and the muscles of the larynx are involved. The patient suffers from dyspnœa, and from loss of voice. The noteworthy feature in these cases is, that the muscles in the head and neck are respected. Rapid as is the development of this form of paralysis, it begins to amend just as rapidly; it is exceptional for death to come about by asphyxia, as occurs now and then in acute ascending paralysis. Whilst recovery is the rule, death has occurred by respiratory paralysis, as in the case reported by Strauss and Heugas."¹

Such great authorities as Oeller, Reinberg, and Erb claim the spinal cord as the primary seat of lesion in lead poisoning. The first had a case of a man aged forty-three, who worked in white lead fifteen months. After nine months the extensors of the left hand were paralysed. This soon disappeared. Three months afterwards he had complete paralysis of extensors, first left, then the right side. The patient had œdema of feet, then general anasarca with albuminous urine. Death occurred from severe dyspnœa (phrenic palsy). Numerous capillary hæmorrhages were found in the central parts of the anterior cornua. Emaciation, especially of the dorsal muscles, is a marked symptom.

Tremors and fibrillary twitches, common in osteoarthritis, and possibly due partially to the effects of alcoholism with which most of the cases of chronic lead poisoning are complicated, have been described.

In diagnosing saturnine palsies, it is useful to remember that the thenar muscles, the first to go in most of the true intracranial palsies, are rarely affected in lead poisoning.

The peronei and the long extensors of the toes are affected, the tibialis anticus supplied by the same nerve escaping. The patient walks on the outer edge of the foot and especially complains whilst going up and down stairs. The peronei escape usually in anterior poliomyelitis (infantile paralysis).

¹ Heugas, *Contributions à l'étude de la Paralysie Saturnine*. (Page 54.)

Atrophy, whilst contemporaneous with paralysis in sepsis and in lead poisoning, *follows it* in embolism and in intracranial hæmorrhage.

Anæsthesia, local or general, so often present in the non-saturnine palsies, is rare in cases of lead poisoning.

Lead again prefers the extensors and the metacarpophalangeal joints, for paretic manifestations; the flexors for exerting its painful effects.

A profound and inexplicable hydræmia should always arouse our suspicions of lead poisoning or of septic intoxication.

Lead palsies are often bilateral, but not symmetrical; they develop usually on the right side first.

Lead appears to prefer the middle fingers. Unlike pus, lead occasionally selects the ulnar side of the body, but the distribution of the musculo-spiral nerve is, as with sepsis, uræmia, and iodism, more frequently a favoured area.

The electric reactions of the lead patient distinguish him from the progressive muscular atrophy case, in whom reaction to faradism goes first, then voltaic response follows, the latter being retained in lead palsy.

If anæsthesia or analgesia occur, not as we have seen very common, it may be differentiated from the hysterical form by the fact that the saturnine subject readily and freely bleeds on wounding the surface. This is an important point, for lead poisoning is often called "hysteria."

Various motor ocular defects have been attributed to the action of lead, especially ptosis, diplopia, with and without obvious strabismus, nystagmus in the acute stage of neuro-retinitis.

Retention and incontinence of urine have both been reported to accompany lead poisoning.

The septic affections of the oculo-motor apparatus generally are familiar to us after diphtheria.

An aching myalgia is very typical of lead poisoning combined with "the fidgets" (anæmia of anterior cornua), reminding us of septic muscle-ache and of the actions of *actea racemosa*, of *arnica*, *eupatorium*, *baptisia* and *rhus toxicodendron*.

Gout and Lead Poisoning.

This paper would be incomplete without a brief reference to the relation of gout and saturnism.

Sir Alfred Garrod found that one third of his gouty cases had been poisoned with lead. This has been confirmed by such careful men as Duckworth, Brunton, and Haig.

Ten years ago I described gout as an attitude of the nervous system which rendered the possessor prone to fall an easy victim to depressing influences. Such influences being age, traumatism, mental solicitude, alcohol. To this list we may add the soluble salts of lead.

I have elsewhere shown a very curious generalisation, that the poisons which can induce an arthropathy in man may cause a neuro-psychosis in woman. This is true of uric acid and of lead. I have had under my care women who, when lithic acid existed in the circulation in a free state, had hallucinations, hypochondriasis, or myalgia. They did not get an arthritis as men would have done under similar circumstances.

If a man enter a lead factory he gets a disturbance of his locomotor apparatus. A woman gets a disturbance of her sympathetic or of her cerebro-spinal system.

This holds good even of alcohol which, in some forms and under certain conditions, liberates latent joint disease in man, whilst it is more prone to produce erythema or else delirium, followed by moral deterioration, in woman. Occasionally in passive septic saturation, we see an arthropathy and a neurosis together. Thus I have recently brought before the Medical Society a case of pus causing exophthalmic goitre, lichen urticatus on distribution of posterior cutaneous filaments of dorsal intercostals and double symmetrical chondritis of the tibial head, all in one and the same subject.

Trades predisposing to Saturnism.

There is no doubt that many cases of lead and arsenic poisoning pass before us unchallenged. Lead may enter the body in an infinite variety of ways. Of course certain trades are especially prone to plumbism. Of the ostensible occupations I will not speak, but I will draw attention to a few which we may readily overlook:

Leather cutters, from using a lead slab to cut on; brass workers, from having leaden aprons on their "grip." Leather, such as is used for hat-bands, is sometimes dressed with lead. Pill and paper box makers, the glazed surface of smooth papers being produced by lead salts; the man who takes snuff from lead-wrapped packets. Tea is sent to England in boxes lined with lead. The tailor who holds his measuring tape between his teeth. Compositors and type dressers; the artisan who goes early to the public house to secure the first glass of beer, which has lain all night in the "compo" pipe which connects the engine with the barrel reclining in the cool cellar; pewter pot polishers; those who drink water from a moor which has been shot over, and, of course, the purer the water the greater the peril. Dental plates, cosmetics and hair dyes, often contain lead salts; so do flour, egg powder, and tinned foods. Mr. Leonard Sedgwick tells me that the syrup of tinned fruits is often rich in soluble salts of tin, which cause, like lead, a sharp attack of colic and diarrhoea for which probably we are consulted and we ascribe to that fatally easy factor "slight chill!"

All acid beverages, including sour milk, may accidentally contain lead, and champagne is purposely adulterated with saturnine salts, making it easy to understand the colic which occasionally succeeds a dance supper.

From immemorial times (Oliver, p. 13) wine growers have known that a harsh and acid wine may be materially improved in flavour by adding a little litharge. The endemic colic of Poitou, which broke out in 1592, and lasted sixty or seventy years, has in recent times, and probably with justice, been ascribed to adulteration with lead. I attended a family in Surrey, the members of which were poisoned by a workman who, called to repair a slate cistern, left a pound of white lead in it and forgot entirely its existence, till some weeks afterwards, I found saturnine symptoms appearing and detected this source of lead poisoning.

For purposes both of diagnosis and of treatment, I will venture to give a brief summary of our subject matter.

Seven days after exposure to lead poisoning a man becomes pallid or sallow and is seized with intolerable pain

near the navel, sometimes passing to the testicle, retracted abdominal wall, swollen red gums with or without the Burtonian line, constipation, scanty urine, unequal pupils, slow heart and incompressible pulse of about forty, with unequal radials, ischuria, accentuation of the second cardiac sound, with nausea, green vomit, headache and anorexia, we have to do probably with a case of lead colic, and we must give prompt relief by amyl inhalation and some suitable hypodermic injection, and then afterwards proceed to eliminate the poison by large doses of *potassium iodide*, aided by antiscorbutic diet and by electric baths.

I will now present a picture of typical plumbic pathology, arranged in chronological order—

1. Peripheral neuritis. (Ferrier.)
2. Ascending or centripetal neuritis. (Braun.)
3. Anterior poliomyelitis. (Vulpian.)
4. Multiple punctate spinal apoplexy of anterior cornua in cervical region (Elliott); also in cortex (Ollivier).
5. Atrophy of anterior ganglia (Braun, Monakow); pigment changes and vacuolation (Elliott).

A very curious sex differentiation is often seen. The changes are ascending in man and usually descending in woman. This does not always hold good, but it serves to reconcile some of the extremely divergent views as to the method of action of lead.

The action of the uranic salts resembles that of soluble salts of lead in so far that on introducing them into part of the circulation they are prone to induce albuminuria. Inasmuch as pyloric ulcer has followed their introduction into the cellular tissue of the hind leg of certain animals, their action may be compared with that of *sepsin*.

Finally.

We have to use the greatest caution in drawing deductions from a limited number of cases of saturnism, because it is especially the cold, ill-clad, badly-housed, starved, dirty, drunken, and dissolute who especially fall victims to lead poisoning. The cases are nearly always complicated either with uratosis or uræmia, with septic symptoms, with alcoholism, or with innutrition.

who are prone to become the victims of lead

